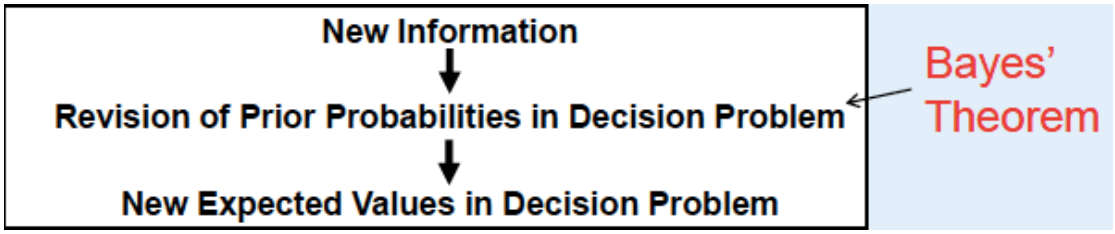
Lecture 4 – Value of Information

Information collection – inserting an information-gathering stage before decision problems is a strategy that can reduce uncertainty and risk



Expected value of information – the value of certain information's impact on future actions

Perfect information – when an expert's information is always correct

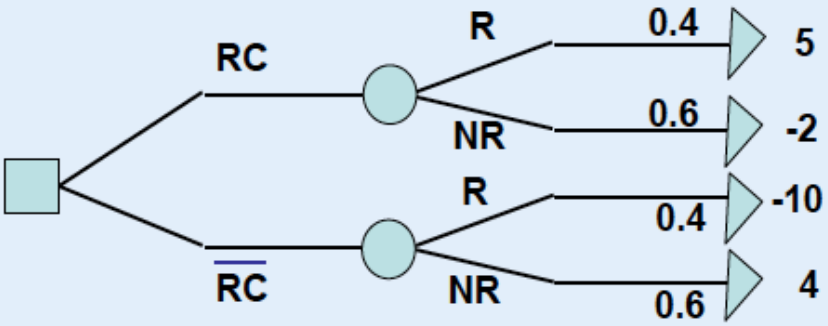
$P(\text{Outcome A} \mid \text{Expert Says "Outcome A Occurs"}) = 1$

If the expert predicts Outcome A, then there is 100% chance it will occur.

Expected value of perfect information (EVPI) – the worth of having certainty compared to uncertainty concerning the outcome. That is, the decision maker has not yet consulted the clairvoyant expert, but is considering whether to consult the clairvoyant in the first place

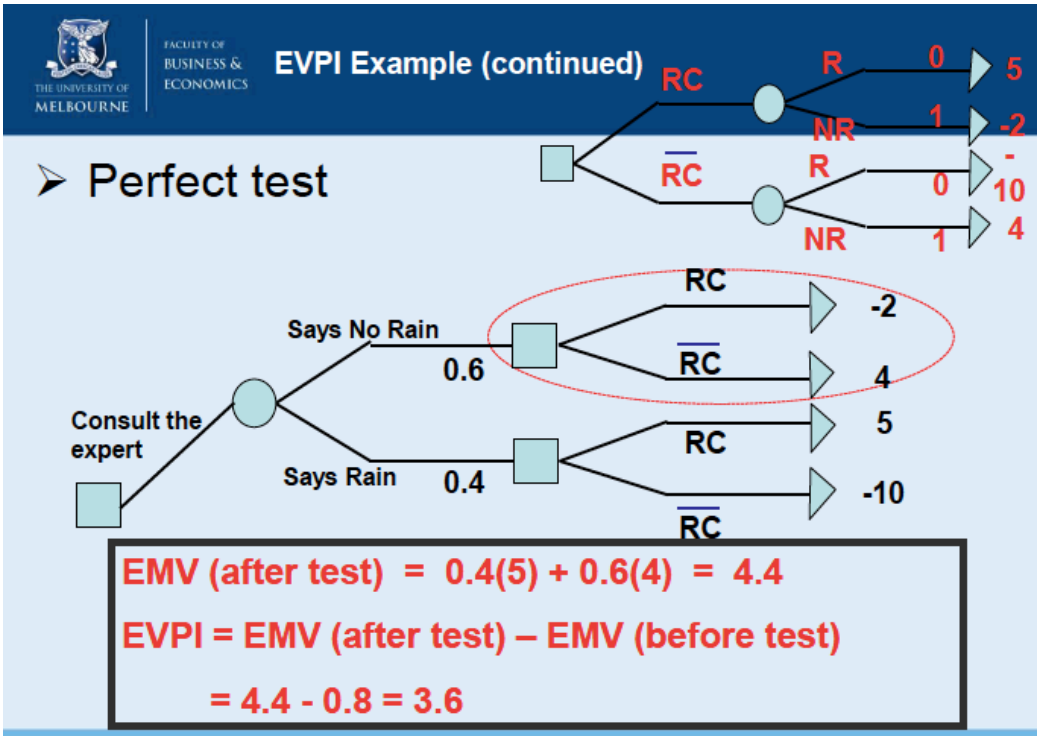
EVPI example:

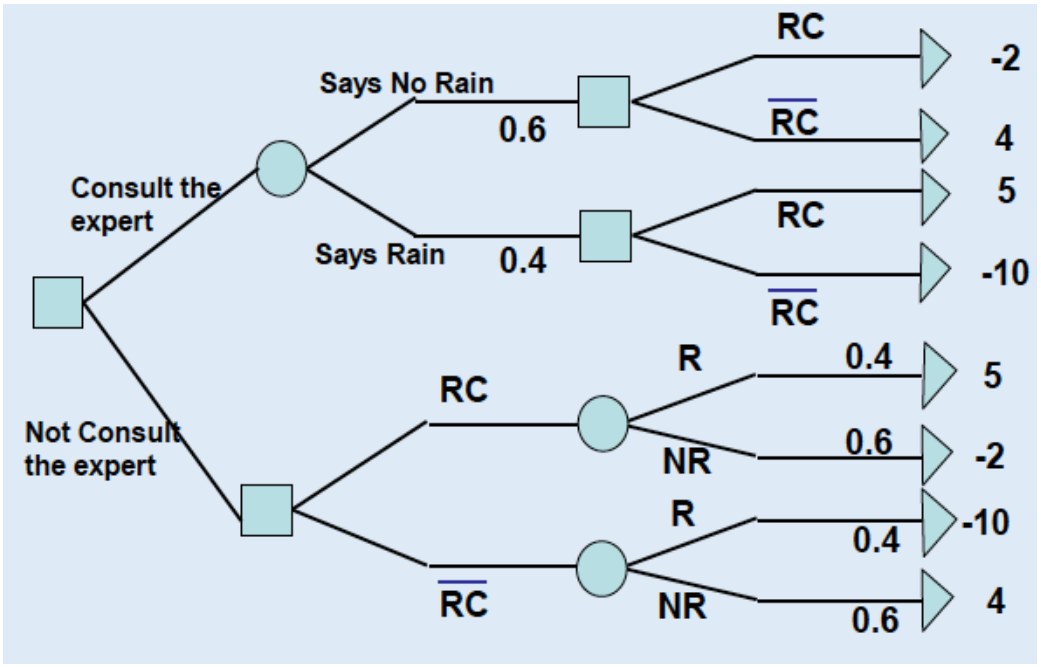
- Question: Should I wear a raincoat?
  RC – Wear Raincoat; $\overline{RC}$ – Not Wear Raincoat
- Two possible Uncertain Outcomes
  Rain (p = 0.4) or No Rain (p = 0.6)



- What are the optimal choice and the resulting EMV?

Take raincoat, EMV(before test) = 0.8





EVPI:

- A major advantage is that it is simple to calculate
- Prior probability of the occurrence of the uncertain event must be equal to the probability of observing the associated perfect test result
- As a 'perfect test', the posterior probabilities of the uncertain events are either 1 or 0
- Optimal choices are generally obvious, once we 'know' what will happen
- No need to use Bayes' Theorem